Marine Riparian Areas: Protection and Preservation in Puget Sound and the Georgia Basin

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Abstract
Riparian buffers and setbacks are commonly used as a management tool in the United States to protect water quality, control erosion, and enhance wildlife in freshwater systems. Setbacks and buffers, whose effectiveness in freshwater systems is well documented, have been used as a Best Management Practice in forestry and agriculture since the 1950s and, more recently, have been used to control and abate Nonpoint Source Pollution (Desbonnet et al, 1993). Although U.S. coastal areas are experiencing problems similar to those of freshwater systems, little research has been done to document the functions and values of marine riparian vegetation. Our first paper, 'An Assessment of Riparian Functions in the Puget Sound Nearshore Ecosystem', was written to develop a rationale and provide a review of riparian functions as they relate to the marine environment.

This paper builds on our first paper by providing additional information from recent riparian-related research and a regulatory overview of U.S. laws governing the coastal zone. The purpose of this paper is to begin to develop a framework for a discussion of marine riparian buffer and setback policies in Puget Sound and the Georgia Basin. We provide an overview of the current regulatory situation in Puget Sound and the Georgia Basin as it relates to the marine riparian zone. We also provide an overview and comparison of two areas in which marine riparian buffers and setbacks are used as a management tool: Chesapeake Bay and Rhode Island. This comparison includes an overview of the goals and management objectives for each region, implementation strategies, and, where possible, their successes and/or failures in achieving their goals and objectives.

Introduction
The functional importance of riparian systems to the health and integrity of freshwater bodies such as rivers, streams and lakes has been the subject of intensive scientific study for over three decades. This large body of research is due in part to the extensive destruction of freshwater riparian areas from forestry, agricultural, residential, industrial and other uses (Good et al. 1998) and to the subsequent declines in the water quality and biological integrity of their adjacent waterways. This research has increased our understanding of the critical habitat functions of riparian areas for maintaining healthy stream and riparian ecosystems, which in turn has led to increased protections of freshwater riparian areas by resource managers nationwide. A variety of tools have been employed to protect riparian systems, but two that are being used with increasing frequency are buffers and setbacks. Buffers and setbacks along freshwater bodies—particularly streams and rivers—have been used as a best management practice (BMP) in forestry and agriculture since the 1950s and, more recently, have been used to control and abate nonpoint source pollution. (Desbonnet et al. 1993)

Riparian systems along marine shorelines, including estuaries, have not been subjected to the same level of analysis, and therefore their functions and values remain largely undocumented. Brennan and Culverwell (2003) attempted to improve our understanding of marine riparian systems by providing a review of riparian functions as they relate to the marine environment. Using the most commonly reviewed freshwater riparian function topics as a template, they provide an assessment of marine riparian functions and values and determined that marine riparian systems provide ecological functions similar to those found in freshwater systems and are likely to provide additional functions unique to nearshore marine systems.

Using the technical information generated in Brennan and Culverwell (2003) as a basis for developing resource management decisions, this paper provides a review of laws governing coastal areas and provides a policy analysis for marine riparian management. The purpose of this paper is to develop a framework for policy discussions of marine riparian protection in Puget Sound and the Georgia Basin (although Georgia Basin information is far less extensive). Five key elements are included in this paper. **First**, an overview of the current regulatory structure in Puget Sound (and to some degree the Georgia Basin) as it relates to marine riparian systems. **Second**, an overview of the status and fate of marine riparian systems in Puget Sound and the Georgia Basin. **Third**, an overview and comparison of two marine areas

in which riparian buffers and/or setbacks are used as a management tool (Chesapeake Bay and Rhode Island). **Fourth**, an overview of non-regulatory tools such as incentive programs that are designed to maintain the functions and values of marine riparian areas. **Fifth**, a results/discussion section, including a set of recommendations for resource managers and others involved in decision-making that affects Puget Sound and the Georgia Basin's aquatic resources.

Definitions

Riparian areas:
Riparian areas are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands. They include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., a zone of influence). **Riparian areas are adjacent to perennial, intermittent, and ephemeral streams, lakes and estuarine-marine shorelines**. (emphasis added) (National Academy of Sciences, 2002)

Setback:
The distance landward of some coastal feature (e.g., the ordinary high water mark) within which certain types of structures or activities are prohibited.

Buffer:
A horizontal distance separating a coastal feature or resource from human activities and within which activities are typically regulated or controlled (i.e. limited) in order to protect the resource or minimize the risk of creating a coastal hazard.

Regulatory Structure
There are a number of federal, state, and local laws that are designed to protect coastal resources in the United States. A comprehensive study analyzing the effectiveness of these various laws in cumulatively protecting U.S. or Canadian coastal resources has not yet been undertaken; however, two studies in Washington State have been completed that provide an overview of the legal and regulatory environment as it relates to Puget Sound's nearshore—including marine riparian—environment. These two studies are *Policy Alternatives for Coastal Management* (Washington Department of Ecology 1994) and *Puget Sound Nearshore Habitat Regulatory Perspective: A Review of Issues and Obstacles* (Broadhurst 1998). Both studies paint similar pictures: a regulatory and policy environment that falls short of adequately protecting the nearshore, including the marine riparian system. Broadhurst (1998) concludes that there are a number of gaps in the current regulatory structure in regards to protecting nearshore marine resources. Similarly, the Department of Ecology report documents inconsistencies between local Shoreline Master Programs in their ability to protect riparian resources.

While both papers include marine riparian systems within their scope, their focus is on the entire nearshore ecosystem and they do not provide explicit detail regarding the regulatory environment as it relates specifically to riparian functions. We attempt to provide these additional details for the federal and state laws that we consider to be the most relevant to the discussion of marine riparian systems:

Federal:
1. Clean Water Act (CWA)
2. Endangered Species Act (ESA)
3. National Environmental Policy Act (NEPA)
4. Coastal Zone Management Act (CZMA)

State:
5. Washington State Shoreline Management Act (SMA)
6. Washington State Growth Management Act (GMA)
7. State Environmental Policy Act (SEPA)
8. State Hydraulics Code

An analysis of these laws reveals many limitations and their failure to provide protection for marine riparian systems. Some of these problems are due to interpretation, implementation, and/or enforcement, and include:

1. Jurisdictional authority of implementing agencies does not extend into the marine riparian zone (CWA, NEPA)
2. Difficulties in regulating land use activities by federal agencies (ESA).
3. Lack of clear guidance/riparian protection requirements at both the federal and state level and a resulting lack of consistency between implementing jurisdictions (CZMA, SMA).
4. Lack of enforcement (SMA, GMA).

Of these various laws, Washington State's Shoreline Management Act and Growth Management Act are perhaps the most relevant to the discussion of marine riparian areas. There are two reasons for this. First, because the jurisdictional extent of both laws covers the entire Puget Sound marine riparian system up to 200 feet landward of the Ordinary High Water Mark. Second, because these laws establish guidelines and restrictions related to land use activities, and it is these activities that can have the biggest impact to marine riparian areas.

Because both the SMA and the GMA are implemented at the local level, much of the responsibility for protecting marine riparian areas falls on the shoulders of 12 county and numerous city governments. These local governments can protect riparian resources by, among other things, designating them as critical areas in their comprehensive plans, establishing vegetation removal guidelines, and/or by establishing setback and buffer requirements.

Because there are so many different local governments involved in regulating land uses within the marine riparian system, it comes as no surprise that numerous inconsistencies across the region exist. For example, Broadhurst (1998) reviewed the shoreline vegetation removal restrictions of the 12 coastal counties and found them to be highly variable or nonexistent. In interviews with county staff, she found that even in those counties with vegetation removal guidelines, regulators admit that it is extremely difficult to enforce, partially due to the fact that vegetation is often removed incrementally or without notification.

Part of the problem also lies in the fact that state guidelines for Shoreline Master Programs (SMPs) recommend, but do not require local governments to protect marine riparian areas. The state's previous guidelines for SMPs recommended the use of vegetated areas for shoreline stabilization and other purposes, but did not require their use. Similar provisions exist in the proposed updated guidelines (not yet in effect), which recommend, but do not require, vegetation.

Marine Riparian Systems in Puget Sound/Georgia Basin

To date, there has been no comprehensive effort to document either the extent or condition of marine riparian vegetation along the shores of Puget Sound and the Georgia Basin. Furthermore, there have been few efforts to document the extent to which riparian vegetation has been affected/removed as a result of residential, commercial, and other types of development. For the purposes of this study, a GIS analysis was conducted to document the degree to which marine riparian vegetation had been removed in King County, both along the heavily developed mainland as well as the more rural shorelines of Vashon/Maury Island. This analysis revealed that 80% of the mainland vegetation (within 200 ft of the high water mark) had been removed, and approximately 30% of the vegetation along the shorelines of Vashon and Maury Islands had been removed. (King County DNRP unpublished data).

It is becoming increasingly clear that marine riparian vegetation plays an important role in the transboundary ecosystem. It is also clear that this ecosystem faces continued threats, primarily from population growth and the development that invariably accompanies it. Ongoing declines in Puget Sound's water quality and biological health are well documented. Georgia Basin, which is arguably better off than Puget Sound in both categories, has been called by Parks Canada "the most at-risk natural environment in Canada." In terms of riparian vegetation, the largest threat on the U.S. side of the border arguably comes from residential development, since approximately 90% of Puget Sound's marine riparian areas are privately owned.

Lessons from Elsewhere

At least two studies have documented the degree to which U.S. coastal states have employed setback and buffer requirements along their shorelines to protect water quality and biological health. Desbonnet et al. (1995) found that eight of 23 U.S. coastal states require marine riparian buffers and/or setbacks. Of these eight states, four—Maine, New Jersey, New Hampshire and Rhode Island—have buffer/setback programs applying to the entire coastline, and four—California, Maryland, North Carolina and Virginia—have buffer/setback requirements that pertain to certain portions of the coast (e.g., along wetlands or estuaries). The stated objectives for the various setback and buffer programs of these states include dune protection, habitat preservation, erosion control, pollution abatement and wildlife enhancement. Since these studies were completed, several states have either proposed or developed coastal buffer and/or setback programs. One example is North Carolina, where estuarine shoreline development has resulted in closure of shellfish beds and

is an important contributor to declining water quality (see Phillips and Phillips 1988). However, we focus specifically on Rhode Island and Chesapeake Bay, in part because they are two of the more established and nationally recognized coastal buffer/setback programs in the United States. Additionally, Rhode Island's program is widely viewed as the most progressive program to date in developing a marine riparian buffer program in residential areas. Because of the preponderance of residential uses of Puget Sound shorelines, we concluded that important lessons could be drawn from Rhode Island's program. In the case of Chesapeake Bay, we determined that it was the only other estuary in the United States that is similar to Puget Sound in terms of size, resource issues, and institutional complexity. Our review identifies the goals and management objectives for each region, implementation strategies, and, where possible, their successes and/or failures in achieving their goals and objectives.

Rhode Island:
Rhode Island's buffer program was originally developed in 1983 and substantially revised in 1993. The program is designed to provide for multiple uses and benefits, including pollutant removal, erosion control, and habitat improvement. One of the most important goals of the program is to strike a balance between land use and protection of coastal resources. To accomplish this goal, buffer widths are tied to lot size so that smaller lots are not rendered unusable. Specific buffer widths were determined by three criteria:

1. Consistency with state mandates.
2. Estimated value in removing pollutants from surface water runoff and provision of wildlife habitat.
3. The reality of implementation along the coast given existing land uses and lot sizes. To ease the permitting process for the development of single-family residences, predefined vegetated buffer widths were developed for residential lands. (Desbonnet et al. 1994)

This decision to tie buffer width to lot size has, however, resulted in non-attainment of program goals in some cases. (Desbonnet et al. 1995). For example, a minimum of a 197-foot buffer is determined to be necessary to achieve 80% removal of Total Suspended Solids (TSS) and provide for wildlife habitat (Desbonnet et al. 1995), but given lot sizes in Rhode Island, 197-foot buffers were not practical in all areas. However, wider buffer widths were applied to lands adjacent to conservation and low-impact activity waters of the coast, which comprise approximately 80% of all coastal waters in Rhode Island. (Phillips and Phillips 1988)

Chesapeake Bay:
Chesapeake Bay's marine riparian buffer program officially started in 1983 with the signing of an historic agreement between the states of Virginia, Maryland, and Delaware; the District of Columbia; and the US Environmental Protection Agency (EPA). This agreement was the direct result of significant declines in the Bay's water quality and biological resources, which followed extensive human population growth in the region. Nonpoint source pollution took a particularly heavy toll on aquatic resources and resulted in a heavy economic impact. For example, the Bay's once-valuable shellfish industry was severely affected by failing septic systems and other sources of contaminants entering the Bay (Plummer 1992). In addition, various governmental organizations and other entities were stuck with the cleanup costs, which totaled $3.5 billion between 1985 and 1996 for nutrient input control measures alone. (Butt and Brown 2000)

As part of the agreement, signatory states agreed to establish critical areas, including 100-foot buffers, along Chesapeake Bay's shorelines. Each state/district implemented their responsibilities under the Chesapeake Bay Agreement at different times and in different manners; by the late 1980s, however, all signatory states/districts had established programs for implementing the 100-foot buffer requirement. The various objectives stated by these different programs for establishing the buffer include: retarding runoff, preventing erosion, and filtering nonpoint source pollution. Each jurisdiction allows for certain exemptions within the buffer zone, including areas where existing development prevented the buffer from fulfilling its functions, grandfathered single family residences, water-dependent activities, and agricultural activities (although some vegetative filter strip is still required).

While no comprehensive study has been done to evaluate buffer effectiveness throughout the Bay, a Joint Legislative Audit done in Virginia in 2000 revealed that 30% of the files reviewed allowed encroachments for non-exempt applications within the vegetated buffer. Additionally, they found that enforcement was inconsistent across county governments charged with implementing the buffer requirement, and that state oversight had been weak. (The Virginia General Assembly 2002)

Non-regulatory Tools
A 1998 study designed to assess the effectiveness of coastal management tools in protecting beaches, dunes, bluffs and rocky shores in the U.S. found that coastal states are currently utilizing 26 tools to achieve resource protection in coastal waters, including estuaries. In addition to regulatory buffers/setbacks and control over shoreline development, this list includes planning, stewardship of state lands, coastal land acquisition, incentive programs and research and public education about shoreline processes and human interaction. (Bernd-Cohen et al. 1998)

Our paper includes six examples of two of these tools: incentive programs and educational efforts. Our decision to include non-regulatory tools stems from the high percentage of Puget Sound's marine riparian system in private ownership, and to the difficulties in regulating land use activities on private land. In some instances, programs from non-coastal states were included because they involve incentives for shoreline property owners to voluntarily have no-touch buffers along water bodies. These kinds of programs are easily translatable to marine shorelines.

One example of an incentive program that appears in our paper is the Open Space/Current Use Taxation Program (RCW 84.34), which enables local governments to offer property tax reductions for property owners who set aside certain natural areas. Eligible areas are defined in a Public Benefit Rating System that is developed by the local jurisdiction (White 1994). In King County, the program provides incentives to encourage private landowners to voluntarily conserve and protect land resources, open space and timber. In return for preserving resources, the land is assessed at a value consistent with its "current use" rather than the "highest and best use." The reduction in assessed land value is greater than 50% and as much as 90% for the portion of the land participating in the program. Over 650 landowners and 7500 acres (3035 hectares) are presently participating in these two programs. (http://dnr.metrokc.gov/wlr/lands/incentiv.htm) Marine riparian areas are among the resource areas that can be protected under this program (personal communication, Ted Sullivan, King County Department of Natural Resources and Parks). However, few marine shoreline property owners have thus far chosen to do so and funding levels at King County prevent the level of outreach required to encourage residents to participate. This type of incentive program is included as Recommendation #51 in the Nearshore Habitat Loss report.

Discussion/Recommendations

Puget Sound's water quality and biological resources have been severely impacted by human growth in the region. With the Sound's population projected to increase by 1.5 million by 2020, resource managers will need to seek creative solutions to incorporate this growth while simultaneously protecting the area's defining waterway. Resource managers in other U.S. coastal areas have addressed some of the same issues currently facing Puget Sound managers (such as nonpoint source pollution and closure of valuable shellfish beds) with regulatory tools such as buffers and setbacks. We emphasized this tool because buffers and setbacks are generally accepted as the most effective way of protecting freshwater aquatic riparian habitats (Cummings et al. 1994; Phillips 1989). Additionally, regulatory tools, including buffers and setbacks, ranked highest in their ability to protect estuarine resources in a national study to determine the effectiveness of state coastal management programs. (Bernd-Cohen, 1998) Finally, the U.S. Environmental Protection Agency (EPA) recommends the use of buffers and setbacks in coastal areas as a tool to reduce nonpoint source pollution. (EPA 1993) Therefore, we conclude that if resource managers are serious about protecting water quality and biological resources in Puget Sound and the Georgia Basin, they will have to start considering following in the footsteps of their east coast counterparts and find ways to implement buffer and setback programs. However, we also recognize that such a task will be extremely challenging. We therefore included examples of non-regulatory tools for protecting marine riparian vegetation on both sides of the border. Some of these non-regulatory tools appear to be extremely promising in helping to protect riparian resources, and serious consideration should be given to both enhancing and expanding them.

Some of our **recommendations** for resource managers in Puget Sound and the Georgia Basin are:

1. A comprehensive inventory of the extent and condition of marine riparian vegetation in Puget Sound and the Georgia Basin should be undertaken.
2. Clear guidance and requirements related to the protection of marine riparian areas should be included in both the State Shoreline Management Act and the State Growth Management Act—Critical Areas section. The guidance and requirements should be well researched and incorporate lessons learned from other coastal state's buffer/setback programs. Incentive programs should be included.
3. Local governments should be required to establish buffers along Puget Sound and Georgia Basin shorelines. Buffers requirements should be function-based and strive to preserve multiple functions.
    - State agencies should provide local planners who are updating Shoreline Master Programs and/or Critical Area regulations with technical and other information to help establish and defend setback and buffer requirements. This includes providing examples from other jurisdictions.

4. Incentive programs such as the Island County Marine Resources Committee's Backyard Wildlife Habitat Program (modeled after the National Wildlife Federation's Backyard Habitat Program) should be expanded to other Puget Sound and Georgia Basin areas.
5. Other incentive programs should be strengthened and expanded to better protect marine riparian areas, such as Washington State's "Open Space Current Use Taxation Program."
6. Given that proposed Shoreline Master Program guidelines do not explicitly require protection for marine riparian systems, state agencies should work diligently to assist local governments interested in protecting regional resources with vegetation protection programs, be they regulatory or voluntary.
7. A basin-wide education program should take place to ensure that Puget Sound and Georgia Basin residents better understand the functions and values of marine riparian vegetation.

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